CLAIMS

We claim:

1. A cellular network comprising:

a plurality of subscribers communicating with the base station using orthogonal frequency division multiple access (OFDMA);

at least one base station having logic to coordinate multiple-access and information exchange between the at least one base station and the plurality of subscribers, the logic selecting a set of OFDMA traffic channels from a plurality of candidate OFDMA traffic channels based on feedback channel information collected from the plurality of subscribers.

2. The network defined in Claim 1 wherein the logic calculates spatial gains of uplink and downlink channels based on responses of spatially separated receivers at the base station.

3. The network defined in Claim 1 wherein the feedback information comprises channel fading information and noise and interference levels for each of the plurality of candidate OFDMA traffic channels.

4. The network defined in Claim 1 wherein the plurality of subscribers send the feedback information in response to a sounding signal from the at least one base station.

5. The network defined in Claim 1 wherein the at least one base station selects a combination of modulation and coding schemes based on the SINR of the selected traffic channel for each accessing subscriber.

6. The network defined in Claim 1 wherein the logic comprises medium access control (MAC) logic.

7. A method comprising:

sending sounding signals to a plurality of subscribers;

receiving channel condition information for a plurality of OFDMA traffic channels; and

performing OFDMA multi-user traffic channel assignment to assign traffic channels from the plurality of OFDMA traffic channels to the plurality of subscribers based on the channel condition information and estimated spatial gains for the uplink and downlink signals.

8. The method defined in Claim 7 wherein the channel condition information comprises information regarding estimated channel gains and channel interference for the plurality of OFDMA traffic channels.

9. The method defined in Claim 7 wherein performing traffic channel assignment is based on channel conditions between one or more antennas at a base station and one or more antennas at subscriber locations.

10. The method defined in Claim 7 further comprising estimating spatial gains for uplink and downlink signals.

11. The method defined in Claim 10 further comprising estimating signal-to-noise-plus-interference rates (SINRs) for the uplink and downlink signals, and wherein performing channel assignment is based on the SINRs for the uplink and downlink signals.

12. The method defined in Claim 11 wherein estimating SINRs for the uplink and downlink signals is performed on all OFDMA traffic channels for all active and accessing subscribers.

13. The method defined in Claim 11 wherein performing channel assignment is based on quality of service (QoS) requirements.

14. The method defined in Claim 13 wherein the QoS requirements include one or more of the following: data rate, time-out, bit error rate, and writing time.

15. The method defined in Claim 13 wherein performing channel assignment is based on priority.

16. The method defined in Claim 7 further comprising determining a combination of coding and modulation schemes when performing channel assignments.

17. The method defined in Claim 7 wherein performing traffic channel assignments comprises a plurality of base stations coordinating to perform the traffic channel assignment.

18. The method defined in Claim 17 wherein each of the plurality of base stations is within a cell and estimates SINRs for uplink and downlink signals across all OFDMA traffic channels for accessing subscribers

19. The method defined in Claim 18 when the plurality of base stations perform estimates for active and accessing subscribers.

20. The method defined in Claim 7 wherein the sounding signal is omni-directional.

21. The method defined in Claim 7 wherein estimating spatial gains for uplink and downlink signals comprises:

estimating broadband spatial channels across the plurality of OFDMA traffic channels for each accessing subscriber;

determining the spatial processing gains for uplink and downlink signals on each of the plurality of OFDMA traffic channels;

predicting signal-to-noise-plus-interference ratio (SINR) for uplink and downlink transmission with spatial processing over each of available

OFDMA traffic channels by adding the spatial processing gain to downlink signal strength feedback from one or more subscribers.

22. A method comprising:

receiving channel characteristics and noise-plus-interference information measured at spatially distributed subscribers; and

assigning traffic channels for an orthogonal frequency-division multiple-access (OFDMA) network.

23. The method defined in Claim 22 wherein assigning traffic channels is performed for the OFDMA network that uses spatial multiplexing.

24. A method comprising:

each of a plurality of subscribers estimating channel gains and noise-plus-interference levels of a set of OFDMA traffic channels in response to a sounding signal;

the plurality of subscribers transmitting to a base station measured channel and noise-plus-interference information;

at least one of the plurality of subscribers transmitting packets using one or more allocated OFDMA traffic channels.

25. The method defined in Claim 24 wherein the plurality of subscribers transmit the measured channel and noise-plus-interference information on pre-allocated channels.

26. The method defined in Claim 24 wherein the plurality of subscribers transmits the measured channel and noise-plus-interference information when paged or when one or more of the plurality of subscribers have a packet to transmit to the base station.

27. An apparatus comprising:

a channel and noise-plus-interference estimator;

an access signal generator coupled to the estimator;

an OFDM modem coupled to the generator.

28. The apparatus defined in Claim 27 wherein the estimator estimates channel gains and noise-plus-interference levels in a pre-determined set of traffic channels.

29. The apparatus defined in Claim 28 wherein the generator encodes channel and noise-plus-interference information to form an access signal.

30. The apparatus defined in Claim 29 wherein the OFDM modem modulates the access signal and transmits a modulated version of the access signal through an access channel.

31. The apparatus defined in Claim 30 wherein the access channel comprises at least a subset of all traffic channels during and access time slot.

32. An apparatus comprising:

at least one spatially separated transceiver;

an access signal detector and demodulator coupled to the at least one spatially separated transceivers;

a spatial channel and spatial gain estimator;

an uplink and downlink signal-to-noise-plus-interference estimator;

a multi-user traffic channel allocator coupled to the calculator, and the estimator; and

an OFDM modem coupled to the allocator.

33. The apparatus defined in Claim 32 wherein the allocator determines traffic channel assignment and a code and modulation combination for each accessing subscriber, and the OFDM modem modulates the traffic channel assignment and transmits a modulated version of the traffic channel assignment to at least one subscriber.

34. The apparatus defined in Claim 33 wherein the allocator determines traffic channel assignment based on broadband spatial channel estimates from the estimator and measured channel and noise-plus-interference information fedback from subscribers.

35. The apparatus defined in Claim 34 wherein the broadband spatial channel estimates comprise the broadband spatial channel between a base station and each accessing subscriber.

36. The apparatus defined in 34 wherein the access signal detector and demodulator detects access signals transmitted by subscribers and demodulates the measured channel and noise-plus-interference information fedback from subscribers.